Sandia National Laboratories

Hybrid Wide Range Transimpedance Amplifier

BENEFITS

- Log amplifier-like range with linear outputs
- No data dropouts for auto-ranging
- Simultaneous low noise and wide-range outputs
- Best reliability for unknown signal strength
- Single front-end amplifier with greater survivability

APPLICATIONS

- Photodetectors
- X-ray/Gamma & radiation detection
- Optical power meters
- Fiber alignment
- Characterizing laser dynamics (threshold, pre/post pulse)
- High dynamic range, high-speed current sensing

PATENTS

- US No. 7,825,735 (SD #11248)

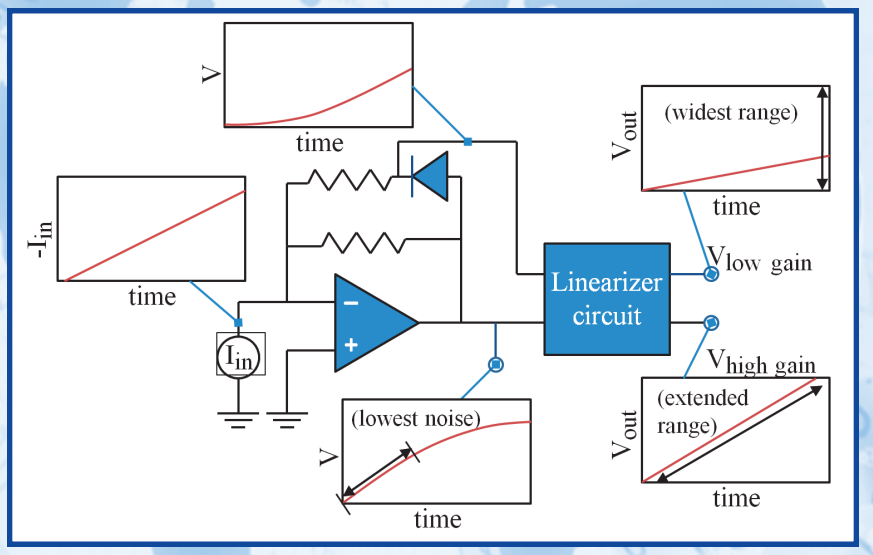
INTELLECTUAL PROPERTY & LICENSING CONTACT

Dan Allen
(505) 284-6752
dgallen@sandia.gov

Summary

Many applications require wide range detection, where detector current is converted to a voltage by a transimpedance amplifier (TIA). High gain TIAs provide low noise but easily saturate. Logarithmic TIAs provide wide range, but nonlinear response. Auto-ranging circuits lose data when switching gain. Range is especially a challenge for modern low supply voltage ICs, where to maintain adequate resolution over a wide range the engineer has to reduce TIA gain, fight a rising noise floor, and add costly bits the analog digital converter (ADC).

To solve this problem Sandia engineers developed a hybrid TIA that combines a high gain and logarithmic amplifier in one. The hybrid TIA cleverly utilizes nonlinearity to provide wide range sensitivity, but conveniently internally linearizes the outputs for further in-line amplification or datalogging. With two outputs to chose from, an ADC may record data from the low noise output as signal rises, then switch to recording the wide range output with nanosecond digital logic speed, effectively extending the ADC's range, while preserving signal linearity and data fidelity.



Licensing & Partnering Status:

Various licensing and partnering options are available.

Technology Readiness Level:

Sandia estimates this technology at a TRL 6: the representative laboratory prototype has been demonstrated in application-relevant environments.

National Nuclear Security Administration

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the United States Department of Energy's National Nuclear Security Administration under contact DE-AC04-94AL85000. SAND #2010-8683P

Sandia National Laboratories